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A Clinical Information System for Psychiatry

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Abstract

At the Academic Hospital of Nijmegen (AZN) a project is started with the aim to improve the quality of patient care and to facilitate patient directed scientific research, by introducing standardized procedures and assessment tools that will be offered by a computerized information system. The resulting Clinical Information System (CIS) should reflect the contributions of all associated disciplines at the department: psychiatrists, psychologists, nurses, social workers, and occupational therapists.

One of the main problems that arised during the beginning of the project is the simultaneous restoration and development of a new general Hospital Information System (HIS) at the AZN, the Radboud Order Communication System (ROCS). Many procedures that were supposed to be components of the CIS, appeared to be components of the new HIS. The CIS should be based on the HIS in order to provide an optimal redundancy in data and integration of both systems. We studied the proposed components of the CIS and compared these with the components of the HIS in order to redefine the contents of this project.

We found that ROCS provides almost all components of the current clinical practice at the department of psychiatry. However, the introduction of some standardized procedures and assessment tools are not or not fully provided by the HIS. Consequently, these extensions to the current information system are the candidate components of this project: the pharmacological treatment procedure, and the assessment tools.

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1. Introduction

In comparison to other medical specialties psychiatry still makes marginal use of information technology. Over the last two decades several attempts have been made to develop psychiatric information systems to support the clinician in diagnosing and treating behavioral diseases. However, most of these systems are not used in practice, (Bemmel, J.H. van, 1995).

Various clinical procedures in psychiatry are already available as computer applications, (Schwartz, M.D, 1990; Üstün, T.B., 1994; Lelliot, P., Flannigan, C., and Shanks, S., 1994; Bemmel, J.H. van, 1995). More specific, there are now computer applications for assessment (Wetzler, S., 1990), diagnosis (Peters, L, Morris-Yates, A., Andrews, G., 1994; Malchow, C.P., Kanitz, R.D., Dilling, H., 1994), treatment (Plutchik, R. and Karasu, T.B., 1990; Oakley-Brown, M.A. and Toole, S., 1994), outcome-analyses, (Sederer, L.I., and Dickey, B., 1996), and also for components like the electronic agenda, medical record, automatic patient data-archives.

However, most of these applications are still acting as separate units: they cannot communicate with each other and often these components cannot be easily integrated into an unifying Clinical Information Systems (CIS). There is a lack of general guidelines or standards for the development, linking or integration of components, (Wilkins, G., 1994). But even if a ready-made unifying CIS would be available now, it still is doubtful whether the system would fit to the clinical practice of every mental care center.

About one and a half year ago the department of Psychiatry at the Academic Hospital Nijmegen (AZN) initiated a project with the aim to improve the quality of patient care and to facilitate patient directed scientific research. To accomplish these aims, it is reasoned that many procedures in psychiatry can be described in protocols and standardized. Subsequently, the resulting protocols can be converted to a computer language and data-files, forming decision supportive programs (DSP) and a database management system (DBMS).

The computerized information system should reflect the contributions of all associated disciplines at the department: psychiatrists, psychologists, nurses, social workers, occupational therapists, and secretaries, comprising all clinical procedures at the department, starting at the referral and ending at the dismissal of a patient. Next, the system has to be extended with standardized measuring-instruments and standardized decision procedures, covering most of the clinical procedures.

The resulting computerized system has to unify the various DSP or building blocks, forming a local CIS at the department of psychiatry,

In most hospitals the administration is already handled by a HIS. Although a HIS has other properties than a CIS, the exact demarcation between those systems is not so clear, (Bemmel, J.H. van, 1995). Ideally, the CIS should make optimal use of relevant data stored in the HIS: A CIS should start were a HIS ends.

At this moment the HIS at the Academic Hospital Nijmegen / St Radboud is in a process of restoration. A special project team is working on a new more elaborated HIS, the so called Radboud Order Communication System (ROCS). The project started two years ago and it will take some more years to finish. Meanwhile it is not complete clear what this system will offer and how it will work; the system is not

operational. This uncertainty more or less frustrates the development of the CIS for psychiatry, because the CIS has to fit to the ROCS, but the ROCS isn't there yet.

Until now most of the future users at the department of psychiatry are not very familiar with computer applications, the application of standardized procedures and assessment tools. So at the same time this project started, the future users were informed about the planned reorganization. This reorganization encompasses at least several shifts:

- a) a shift from a paper-based information system to a computerized information system,
- b) a partial shift to the application of standardized clinical decision procedures,
- c) a shift to the use of standardized assessment procedures.

Although most users are still unfamiliar with computer applications, a brief pilot study performed at the beginning of the project indicated that there is almost consensus about the need to introduce standardized procedures, and that computers are seen as being a great support, (Schuur, J.E., 1996).

At the department of psychiatry a few protocols and standardized measuring-instruments are already available. However, most of the procedures still have to be formalized and described. Initially, the search, development and selection of protocols was considered to be a part of this project as well, (Zitman et al, 1995). However, soon it showed up that this task should actually be done by the experts working in the clinical field.

Furthermore, it can be quite valuable to familiarize the users with the planned reorganization by integrating them step by step into this process, instead of just buying the presumed software around the corner and installing it.

The in depth analyses of the clinical process of psychiatry itself will undoubtedly bring up interesting material that can enhance the overall insight in psychiatry and its methodology. For, in order to make psychiatry evidence-based it should first have a methodological fundament and structure that allows to make such inferences at all.

1.1. Overview

The organization of this paper is as follows. Section two is a review of the original outline of the project. In section three we present the organization of the department of psychiatry at the AZN, and introduce a model of good clinical practice. This model serves to describe the main procedures at the department, and to describe which of these procedures will be provided by the team of the ROCS project. In section four we evaluate the procedures of the current information system that will be provided by the ROCS, while in section five we summarize the provisions of the ROCS related to the proposed extensions of the current information system. Based on the conclusions of the preceding sections, in section six we present the remaining procedures or components which clearly concern this project. In addition we describe and discuss some elements of the procedures which are not easily grouped to either of the projects. Finally, in section seven we redefine the outline of the project and we present the project work plan.

2. Project outline

The project outline is the original description of this project, its aims and methodology. It describes the proposed and the to be developed CIS.

In this section the most relevant information of the project description (Zitman et al, 1995) will be reviewed: 1) The proposed features of the software, 2) the proposed components of the CIS, and 3) the time schedule of this project.

2.1. System requirements

The proposed requirements for the CIS under consideration are the following:

- suitable for using different diagnostic and treatment protocols, depending on the pathologic condition and evolving problems.
- suitable for using different diagnostic and treatment protocols of every discipline; psychiatrists, psychologists, social workers, nurses and occupational therapists.
- suitable for using different protocols simultaneously by one patient.
- suitable for supplementing measuring-instruments.
- user friendly, but constructed in a way that the user cannot skip relevant components.
- suitable to operate in a Local Area Network (LAN).
- suitable to make adaptations and changes.

2.2. Proposed program components

The CIS is proposed to consist of three major components:

1. The entrance module or main menu, comprising the Medical Record⁴.
2. Diagnostic protocols
 - a. A general psychiatric-diagnostic protocol. Elements:
 - standardized determination of DSM-IV/ICD-10 diagnosis, (by means of the SCAN or CIDI)
 - AMDP-system
 - supplementary data
 - b. A general nursing protocol. Elements to be determined later.
 - c. Pathology or problem specific diagnostic protocols:
 - benzodiazepine addiction
 - depression
 - psychoses
 - relational related problems

⁴) Although the Medical Record module is not mentioned as a proposed component in the original project description, paragraph Methodology E, it is mentioned in the Work Scheme, paragraph G. However, in this paper the Medical Record module is listed together with the other proposed components of the CIS.

3. Treatment protocols
 - a. A general psychiatric treatment protocol that will be used for any case in which a specific protocol is still not available.
 - b. A general nursing treatment protocol that will be used for any case in which a specific protocol is not available.
 - c. Pathology specific treatment protocols:
 - benzodiazepine addiction
 - depression
 - psychoses
 - anxiety
 - relational related problems

The main menu is served to be an entrance to the program showing all possible options to be selected. It also comprises the Medical Record, an account of a patient's course of disease after he or she sought medical help. It contains findings, considerations, test results, and treatment information, (Bemmel, J.H. van, 1995).

After a new patient has been registered, an intake follows comprising a standardized psychiatric history and social demography, a standardized diagnostic interview and eventually some supplementary instruments ends with suggesting a DSM-IV and ICD-10- code. Next, one or more specific treatments protocols can be triggered by a specific diagnostic code, and presented to the care giver. A specific diagnostic code and/or treatment can trigger a selection of relevant assessment tools and a time schedule design, to evaluate the effect of the treatment.

2.3. Time Schedule

Month:

- 1 to 6:** Making acquaintance with the department.
Following lectures.
Orientation treatment protocols and measuring-instruments.
Orientation software. Implementation Medical Record and measuring-instruments.
- 7 to 12:** Selecting software.
Implementation electronic Medical Record and measuring-instruments.
Composing criteria for literature searches.
- 13 to 18:** Starting data collection with the Medical Record and measuring-instruments.
Literature research depression diagnostics and treatment.
Literature research concerning a specific nursing topic.
- 19 to 24:** Composing depression protocol including measuring-instruments.
Composing protocol of a specific nursing topic.
- 25 to 30:** Ending data collection with Medical Record and measuring-instruments.
Implementation depression and specific nursing topic.
Literature research psychoses and another subject A not linked to a specific diagnosis and to be defined later, for instance relational therapy.

- 31 to 36:** Implementation psychoses protocol and protocol X.
Literature research of two other topics, B and C.
- 37 to 42:** Implementation protocols B and C.
Literature research topic D and E.
- 43 to 48:** Implementation protocols D and E.
Ending publications

2.4. To be followed

In the following paragraphs the progress of this project will be described, starting at the beginning and ending at the current date. As far as possible the time schedule will serve as a guide through this description.

Since the start of this project a lot of what has been proposed had to be redefined. As already has been mentioned, the development and restoration of the HIS at our hospital caused quite a lot confusion. The rise and the implications of the ROCS were not fully recognized in the profile of this project. Several components of the proposed CIS appeared to be components of the ROCS as well. Furthermore, making progress in formalizing the clinical procedures in protocols showed to be not so easy and flourishing as was expected.

The aim of this paper is to describe, explain and define what is feasible and convenient in this project. This study will therefore form the starting point for the description and elaboration of the remaining components in this project.

3. Organization of the department of psychiatry

The department of psychiatry is one of the various medical departments of the Academic Hospital Nijmegen (AZN). It comprises four main care units: Clinic, Outpatient Unit, Day Care, and Consultation Unit.

A patient can be refereed from outside the hospital or from another department inside the hospital. When a patient is refereed to the department of psychiatry, he or she can be assigned to one of these units. Of course, during the treatment the assignment to a specific unit can be changed.

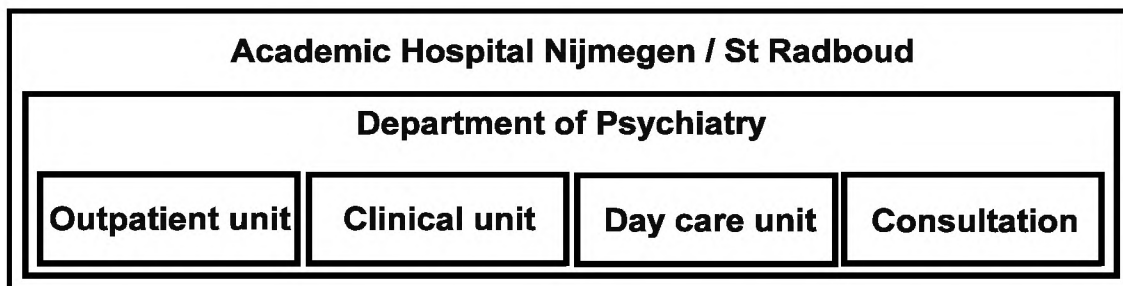


Fig. 1: The department of psychiatry and its four care units at the Academic Hospital Nijmegen.

In essence all these units are working quite independently from each other. They all have their own structure and clinical procedures, though most of these differences are not very significant.

Every unit is more or less managed by a variety of care givers: psychiatrists, psychologists, nurses, social workers, and occupational therapists. All of these disciplines participate in almost all clinical procedures: the intake, diagnosis, treatment, and outcome-analysis.

3.1. *A Model of Good Clinical Practice*

The main task of getting acquainted with the department and its clinical practice for me was forming an overview of all the procedures in a chronological order. We wanted to know what happens, when does it happen, and how does it work (process-analysis). In addition, We wanted to know what information is used and produced during each of the succeeding procedures (information analysis), and the use of this information

Although not mentioned in the project outline, both types of studies are of course necessary to know what has to be formalized and how this should be done. During several interviews it did not seem to be achievable to get a global picture of the entire clinical practice. Therefore we decided to look for a model of clinical practice outside the department and finally found a suitable model of 'good clinical practice', (Morris-Yates, Andrews, Teeson, 1994).

Model of Good Clinical Practice (adopted from: Morris-Yates, Andrews, Teeson)

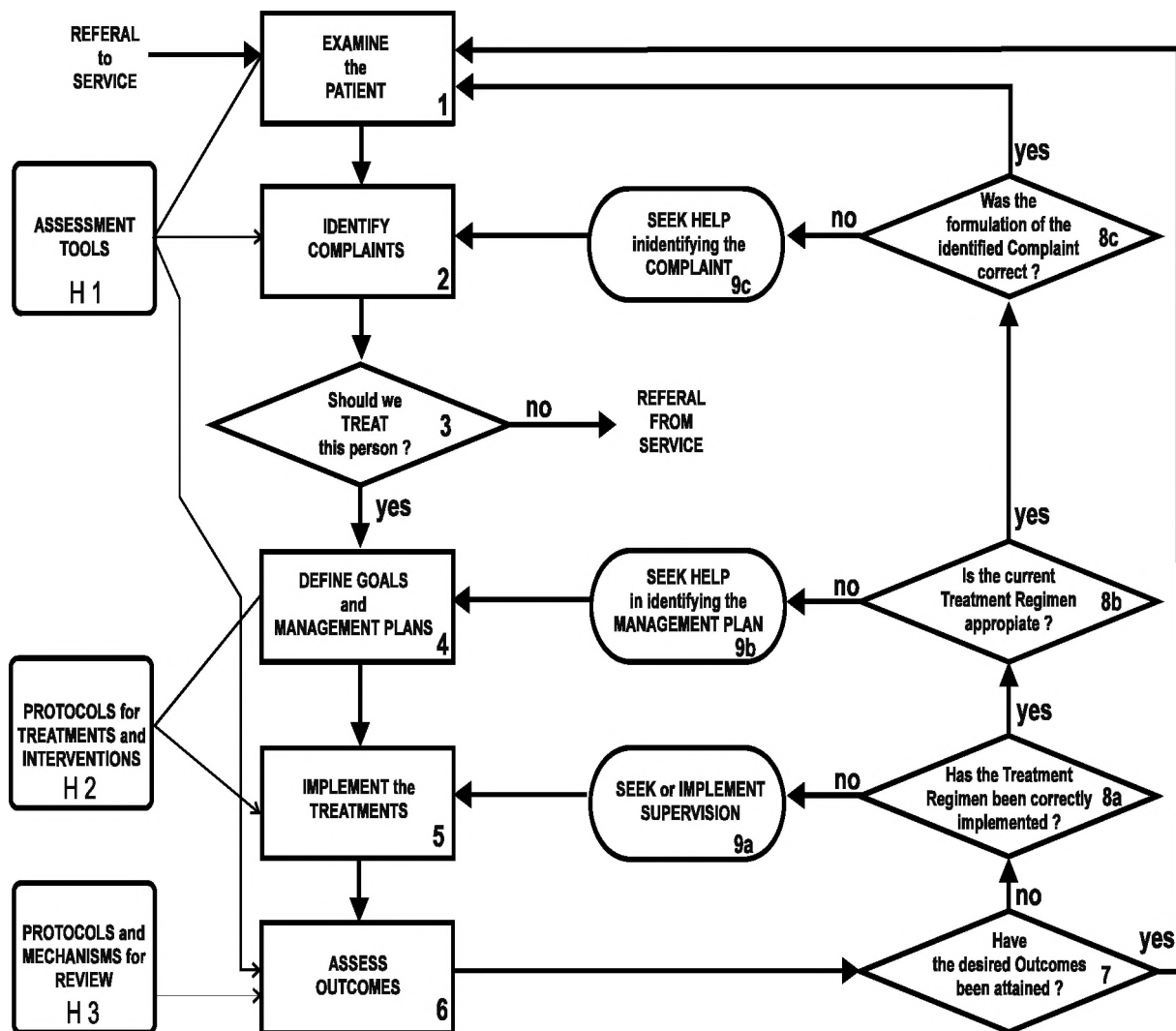


Fig. 2: Model of 'Good Clinical Practice', (Morris-Yates, Andrews, Teeson, 1994)

Looking at figure 2 it appears that the model not only partially describes 1) the current clinical practice at our department (numbers 1 to 9, shown in the model), it also shows 2) the desired extensions to it, that is: the use of standardized assessment tools and mechanisms for review (numbers H1 to H3, in the model).

The four to be standardized procedures in this project are: a) intake, b) diagnosis, c) treatment, and d) outcome-analysis.

Of course the model only reflects the succeeding procedures.

Not shown in this model is the content of every procedure. So the next steps in this project will be:

- a) getting clear the content of every procedure,
- b) matching the content of these procedures with the content of what will be provided by the ROCS, and

- c) determining whether and to which extent a given procedure will be provided by the ROCS

Components not provided by the ROCS are candidates for this project to be developed. So, within the domain of what has been proposed in the project outline, this project can be seen as the complement of the ROCS.

4. The integration of ROCS and this project

The Radboud Order Communication System (ROCS) is the name of the new HIS at the AZN, which is currently being developed. Its main goal is to use computers to collect, store, retrieve and communicate patient care and administrative information for all activities at the hospital. However, the ROCS also contains certain components that extent to that of a CIS, or at least a Clinical Departmental System. Moreover, ROCS will provide some extra components for the department of psychiatry.

In order to define the components that belong to the project here at the department of psychiatry, it should be clear which components are provided by the ROCS.

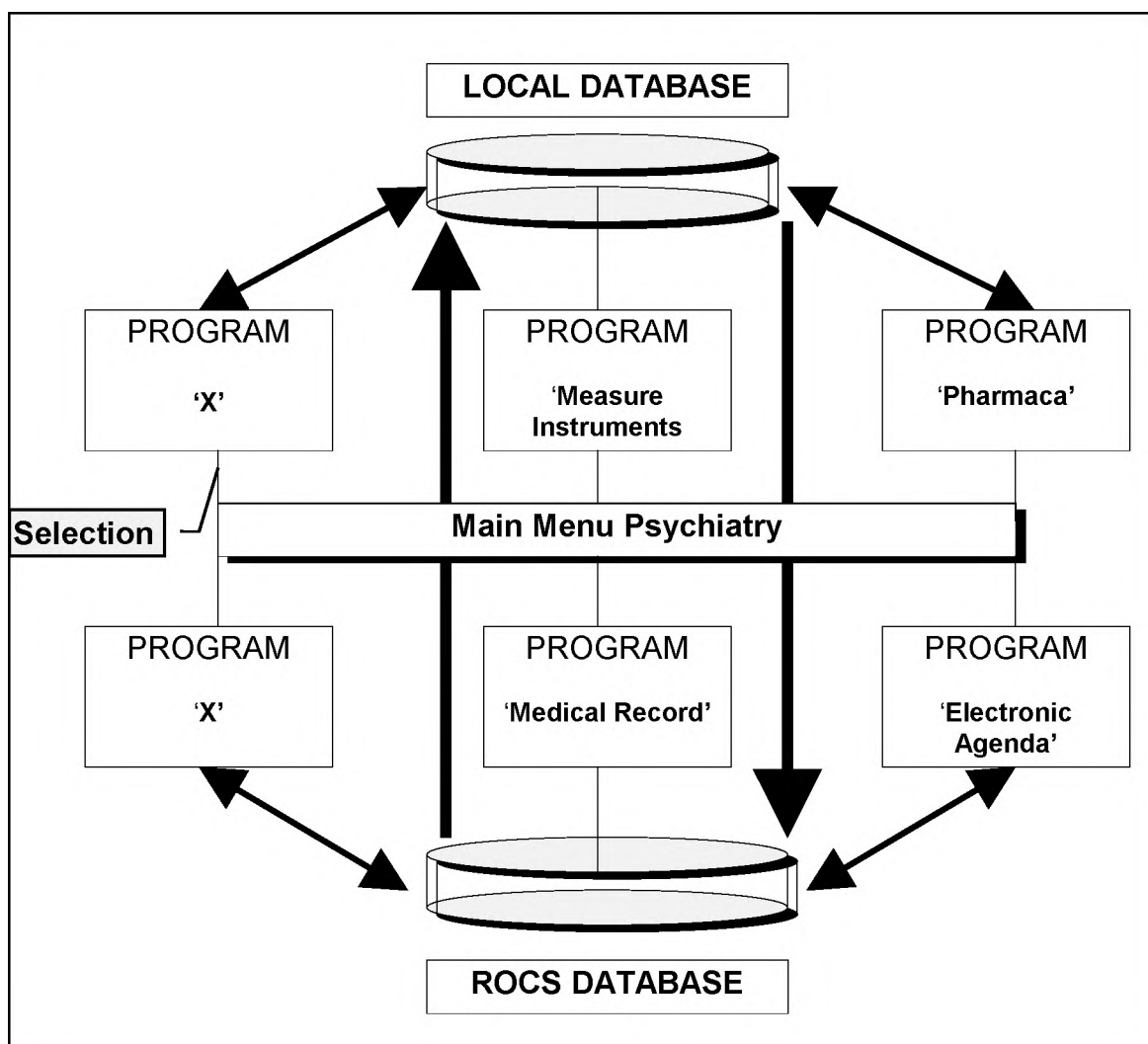


Fig. 3: Model of the integration of the two information systems ROCS and the system to be developed in this project, showing both database systems being linked to their procedures and centrally linked by the main menu. The procedures above the main menu represent CIS procedures, the procedures below represent the ROCS procedures.

The integration of the two systems should not impede the users. Integration concerns linking the relevant data and furnish a central user interface that offers all

the properties of both systems. Both systems have their own database. The to be developed database in this project is the complement of the ROCS database; all relevant data which are not stored in the ROCS database are to be stored in a separate database.

The central user interface serves as the entrance and main menu of the system. From here a user selects a procedure which then will be run.

4.1. *The ROCS Attributes*

Although the ROCS project started about two years prior to the initiation of this project, it appeared that its relevance and its facilities were not fully recognized at the time this project was launched. Furthermore, it appeared that associated departments dealing with medical informatics were not very much involved either. So during the preliminary investigations in this project a lot of what has been proposed in the outline seemed to be more or less obsolete or not applicable anymore.

Quite a few functions or components of the proposed CIS at the department of psychiatry appear to belong to the ROCS project.

In the Functional Specification of ROCS (AZN/ROCS, 1996) an overview is given of most of the procedures and functions that will be delivered by the ROCS project. The most striking finding was that ROCS is actually replacing the paper-form of the patient record (medical record file) by an electronic patient file.

Moreover, because every process, every clinical action at the department of psychiatry is currently still described in a paper-form of the medical record file, it can be theoretically inferred that ROCS actually provides the entire current information system of psychiatry. However, whether this is also practically true, is hard to get clear. One reason for this is that the ROCS is not yet operational, and, as a consequence of this, the department is not able to see whether the ROCS is indeed providing the proposed functions for psychiatry. Another reason is that the members of the department of psychiatry have not yet completely specified and formalized their wishes.

Taking the model of good clinical practice (figure 2) with its succeeding procedures as starting point, it can serve to delineate some of the functions that will be served by the ROCS. The numbers at the left correspond with the numbers in the model of good clinical practice.

Number of reference (see the model of good clinical practice) 0	Procedure	Actions
	Referral	patient registration planning a visit
1	Intake	finding next visiting patient psychiatric interview biographic history demographic data
2	Identification of Complaints (diagnosis)	DSM-IV / ICD-10 diagnostic code selection
3	Treat or referral from service	ROCS Order Treat ROCS Order Dismissal
9 a,b, and c	Seek Help Order additional screening	

Fig. 4: Table showing the procedures of the current information system at the department of psychiatry which are provided by the ROCS. From the left to the right: the number of reference to the model of clinical practice (figure 2), the clinical procedure, and the associated actions.

Not shown in this table but already mentioned is the computerized medical record of the patient, also to be delivered by the ROCS. The medical record is not bound to a specific procedure or function. It is a description of the diverse interactions between the patient and care givers, starting at the moment of referral and ending with the dismissal. Thus, the medical record also comprises the descriptions, decisions or results of the procedures which are primarily not components of the ROCS: Define goals and management plans (4), Implement the treatment(s) (5), assess outcomes (6)

Also not shown in this listing of ROCS components is the proposed general entrance and selection menu, which is a ROCS component as well.

4.2. Conclusions

It seems that the ROCS indeed provides almost if not all current procedures and information processing at the department of psychiatry.

However, this does not imply that there is nothing left to be done in this project, since this project is not only supposed to computerize the current procedures and information processing. Its primary aim is to improve the quality of patient care, and to facilitate patient directed scientific research by means of extending the current procedures with standardized procedures and assessment tools. These standardization's embody the proposed extensions to the current information system. Some of these extensions might be provided by the ROCS as well. So the next step is finding out which of these additions or elements are also provided by the ROCS.

5. Attributes of proposed extensions to current information system

In order to perform scientific clinical research, it should be clear what information obtained during the clinical practice might be relevant for this purpose. Eventually, relevant information has to be analyzed and reduced to its constituting data. These constituting data are the form in which the original information will be stored in tables of a database. In this form the data are accessible for statistical analysis, (see section 10).

Apart from these requirements, it is of course necessary that these data should be obtained in a standardized way. This includes, the use of standardized instruments, with standardized questions and ratings, leading to standardized coded data at fixed intervals during the clinical cycle.

5.1. Proposed extensions to current information system as possible attributes of ROCS

Taking the model of good clinical practice (figure 2) again as starting point, and considering the attributions of the ROCS as possible vehicles that could lead to a relevant data collection which is suitable for data analysis (figure 3), we will now attempt to delineate which of the proposed extensions to the current information system are likely to be provided by the ROCS as well.

Most of the relevant data for purposes of research will be obtained from the following procedures: Intake (1), Identification of symptoms and complaints (2), and assessment of outcomes (6).

The following of these procedures will be furnished by the ROCS:

a. Intake:

As has been described above, the ROCS provides the intake. More specifically: ROCS will provide the input and storage of the psychiatric history, biographic reconstruction, and demographic data, (ROCS, 1996).

At this moment its not clear whether ROCS will deliver a system that stores relevant information in structured way, like, for instance, the AMDP-system, Arbeitsgemeinschaft für Methodik und Dokumentation, (Cuypere, et al., 1990).

b. diagnosis:

The ROCS provides the identification of symptoms and complaints, that is: at least the manual selection of diagnostic codes (DSM-IV and ICD-10).

At the moment it is unknown whether ROCS will provide a manual DSM-IV selection-module with the capability to enter all five Axes of the DSM.

Also it is unknown whether and for exact what purposes Psychiatry will need the capability of entering all the five Axes. Finally it is not clear whether

psychiatry is conveniently served by a module that solely permits entering a diagnostic code.

Initially the process leading to a diagnosis was supposed to be standardized too. Possible candidates for this standardization were the Schedules for Clinical Assessment in Neuropsychiatry (SCAN), (WHO, 1994), or the Composite International Diagnostic Interview (CIDI), (WHO, 1994). However, during the project the Steering Committee of the project decided to remove this component out of this project. The main reason to skip the standardized interview from this project is the time that this interview takes; about three hours.

5.2. *Reduction of the Project Outline*

In the preceding sections we showed that much of what has been specified in the project outline, will actually be performed by the ROCS.

1. The current paper-form information system at the department of psychiatry will almost if not all be served by the ROCS.
2. The proposed extensions (standardization's) to the current information system that are at least partially provided by the ROCS concern the following procedures: the 1) Intake and 2) Identification (diagnosis).
As a result, the following standardized procedures have to be developed in this project: 1) Definition of Goals and Management Plans, 2) Implementation of Treatments, and 3) Assessment of outcomes.

The primary targets of further investigation are thus the standardization's of the three procedures mentioned in the second finding.

5.3. *Conclusions*

At the end of this analysis it can be concluded that the ROCS will deliver at least partially the proposed extensions concerning the intake and identification procedures. The treatment and the assessment of outcomes are the only standardized procedure that will not be served by the ROCS at all.

As have been mentioned before, it still is doubtful whether psychiatry has additional desires concerning the data collection and storage during the intake and identification procedures (see section 10).

For instance it is not known whether the ROCS will indeed provide a standardized intake that conveniently resembles a system like the AMDP-system, also mentioned in the project outline as a possible candidate, (Zitman et al., 1995).

Next, there are expressions of desires that might be indicative that the ROCS attributes will not be sufficient. For instance, among some of the care givers there is a definite craving for an additional system to enter complaints and symptoms, next to

a system for entering diagnostic codes. The nursing section is working on a additional complaint-symptom identification system, based on the eleven health patterns-system of Gordon, (Gordon, M., 1993).

The department has not yet come up with the needed formalized specifications. These concern specifications of the data that should be incorporated during the intake and, in particular, during the diagnosis. Also it is unclear whether Psychiatry wants to use the axial system of the DSM-IV, and if so, whether these entrances should be able to evoke specific procedures.

6. Analysis and definition of remaining to be standardized procedures

The following procedures showed to be components that clearly belong to this project:

1. Definition of Goals and Management Plans
2. Implementation of Treatments
3. Assessment of Outcomes

Note that all of these procedures can -and of course should- be made dependent on data entered and stored during the preceding procedures. An entered diagnostic code, or any other coded diagnostic indication, can trigger a range of appropriate goals or management plans, a range of appropriate treatments, and finally a corresponding range of specific assessment tools.

The same can be done with any other relevant data set. To do so, it is needed to formalize the associated decision trees in protocols. In general it is necessary to categorize all the possible treatments, and preferably, its indications (diagnosis, complaints, symptoms).as well (see also section 10).

6.1. Current state of affairs concerning the relevant protocols

1. Definition Goals and Management Plans & Implementation of Treatment:

At the moment the only constituent of a standardized treatment procedure is a protocol that describes and guides the standardized selection of a pharmacological treatment, (Zitman, F.G., 1997).

A start has been made with the conversion from this protocol into a pseudo command code language and a description of process- and information analyses concerning this component, (Schuur, J.E., et al., 1997).

2. Assessment of Outcomes

The constituents of the standardized assessment of outcomes are measuring-instruments, which are of course widely available. What has to be done here however, is developing:

- a. a program that guides the process of the timing and selection of a assessment tool, based on a protocol that describes the mechanisms for review: Processor.
- b. a program to enter and edit assessment tools: Editor.
- c. a program that actual performs the assessment procedure: Interviewer.

A start has been made with the development of a program QuestMan, (Schoor, J.E., 1997) which is basically a test-manager that encompasses an editor and interviewer.

By now it provides in a system that meets the most relevant features mentioned in the project outline, (Zitman, F.G. et al., 1995).

The program is:

- suitable for supplementing various types of measuring-instruments.
- suitable to make adaptations and changes.

6.2. Defining the undefined

In the preceding sections it is described which of the proposed components will be provided by the ROCS and which of these components have to be developed in this project. However, a number of components that are delineated here as ROCS components still might appear to be components of this project as well.

In connection with some components it might be that the ROCS does not fully provide the desires of the department of psychiatry. This especially concerns those procedures which are relevant in the generation of data obtainable in patient directed research. At the moment this part of the proposed information system is not clear, for most of these protocols still have to be developed.

Subsequently, this section deals about defining the undefined components. Its starting point here is the object system, e.g. the clinical practice at the department.

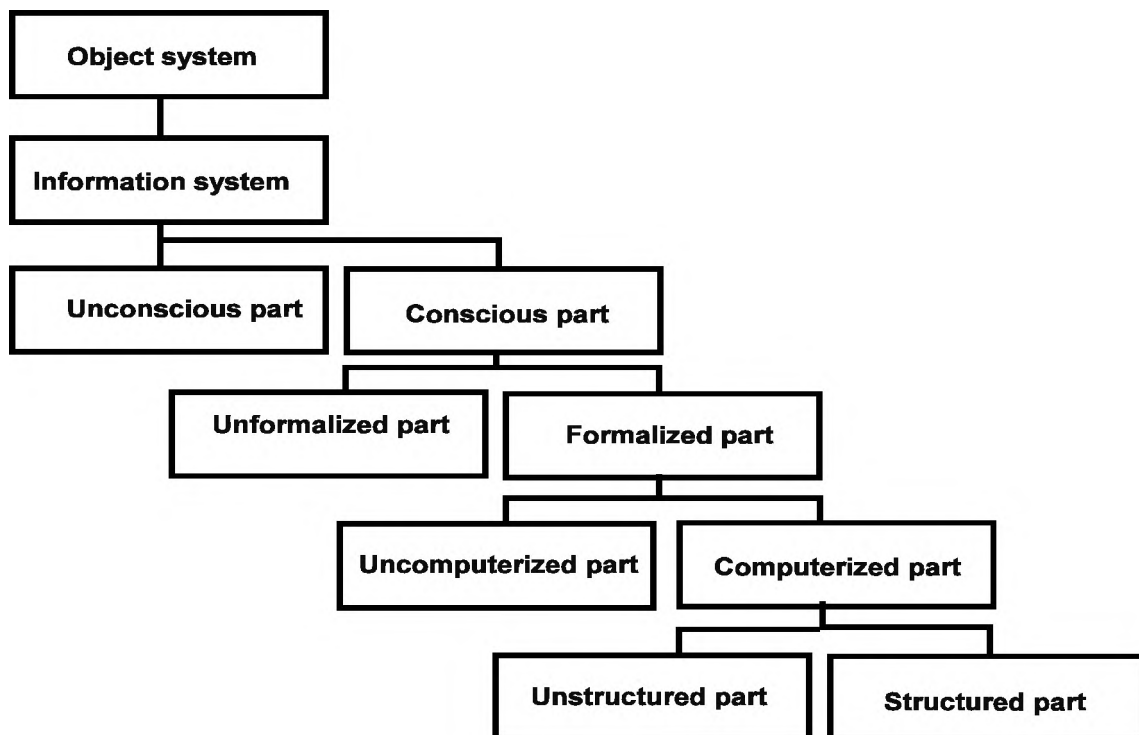


Fig. 5: Scheme showing the diverse divisions of an object system. Adopted from J. Geurts and R. van der Kamp, *Elementaire Informatica; Inleiding Informatieverzorging, HE.2*, Kluwer Bedrijfswetenschappen, Deventer, 1987.

An object system is that part of a system which is of interest, so the object system in this project is the clinical practice here at the department of psychiatry. Knowing all parts of an object system is impossible and this isn't necessary. An information system only describes a certain part of the object system; only that part which really is necessary. So an information system can be seen as a model of the object system.

However, part of the information we use is not known to our self: so, we actually do not know what we know. An information system can therefore be divided in a conscious and an unconscious part. The conscious part can be further divided in a formalized and an unformalized part.

The formalized part reflects the associated procedures, rules, and methods. The formalized part is candidate for an automatic information system. This does not mean that the entire of the formalized system has to be implemented in a machine. So again, the formalized part can be divided in a part that has to be computerized and a part which don't. Finally, the computerized part can be divided in a structured and an unstructured part, the former representing a part that deals with structured data, the latter representing a part that deals with unstructured, textual data, (Geurts, J., and Kamp, R. van der, 1987)

In order to develop procedures that generate data in a way to make them suitable for performing automated procedures like data acquisition and data analyses, these procedures have to generate structured, coded data.

The procedures to be developed in this project can be characterized as being procedures that will generate structured data. But it is still not clear whether the same characteristic holds for those procedures to be developed by the ROCS. In particular this concerns the Intake and Identification of Complaints (diagnosis) procedures.

Part of this vagueness is due to the lack of associated protocols, e.g.: protocols that describe which information is relevant for research, protocols that describe how the relevant information can be reduced to its fundamental data elements, and protocols describing the ways of coding these elementary data constituents.

The development of protocols is not part of this project. The protocols should be developed by those who are experts in the field and working at the department.

The essence of this section is to clarify what and how has to be done in order to construct a system that meets the requirements to generate a database that is suitable for automatic data analysis.

The following steps can help to formalize clinical procedures in order to provide structured, coded data:

- Determine a clinical procedure to be standardized
- Determine the content of information generated by this procedure
- Evaluate the content of the generated information on its relevance for research
- Determine eventual additional relevant information for research
- Determine the means of obtaining the relevant information, (questionnaires and the like)
- Determine a priori the range of mutual distinct categories for grouping the relevant information.
- Create the resulting code-table to code the distinct information categories.

7. Conclusions: The project design

The study of definition ends here with an overview of the content and design of the project, showing its main actions.

We found four general components or topics that are of interest in this project: 1) the implementation of treatment protocols, 2) the implementation of standardized assessment tools for screening and outcome analysis, 3) the continuation of the ongoing information analysis, and 4) the search, analysis, definition of remaining components, additions and adjustments of the clinical procedures.

Procedure	Description	Actions	Application label
1- Treatment	Pharmacological treatment protocol	development of a computer application	PharMate
2- Standardized assessment	general screening instruments specific outcome analysis instruments	advancing the test manager development of protocols describing the mechanisms and schedules of assessments	QuestMan (editor and interviewer) QuestMan Processor
3- Information analysis	collecting and analyzing protocols	- informing users how to structure their protocols - informing users about the progress of the project	
4- Search and analysis a) Intake	- general assessment procedures and instruments - the use of an AMDP - or alike- system. - relevant data collection		
b) Diagnosis	- assessment procedures and instruments - additions to the formal coding systems (DSM-IV/ICD-10) - relevant data collection		
c) Order protocols	- protocols describing when to seek help by whom - protocols describing when to start and end a treatment.		

Fig. 6 Table summarizing current view of procedures or topics and associated actions of the project.

The first two of the four components concern implementing existing protocols, while the other two concern the development of protocols or the process of seeking eventual revisions and adjustments of components that will be provided by the ROCS.

We have a protocol that describes the pharmacological treatment and we made some progress in describing this protocol in a coded language. The next step is to convert this code to the final computer language. In addition we have to study how this component should be integrated in the system.

Also we have a prototype of the test-manager (QuestMan). In order to make it even more flexible, we are working on the elaboration of QuestMan's facilities. Next we have to design and implement a program that can serve as a processor in timing the assessments for a given patient. The processor should be able to track the position in the cycle of outcome analysis of a given patient.

Beside the development of these concrete applications, we have to go on with the process of information analysis in order to obtain more information that can be relevant for this or a next project.

Finally we will study the provisions of the ROCS in order to implement additions or adjustments that are necessary for the computerized information system at the department of psychiatry.

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